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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,282	06/26/2003	Yongjun Jeff Hu	MI22-2266	8289
21567 7590 05/31/2007 WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			EXAMINER PATEL, REEMA	
			ART UNIT 2812	PAPER NUMBER
			MAIL DATE 05/31/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/609,282

**Applicant(s)**

HU, YONGJUN JEFF

**Examiner**

Reema Patel

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 82-87 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 82-87 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/10/06</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This office action is in response to an amendment filed on 1/24/06. Currently, claims 82-87 are pending.

#### ***Information Disclosure Statement***

1. The information disclosure statement (IDS) was submitted on 7/10/2006. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 82-84, 86-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paek et al. (U.S. 6,774,023 B1) in view of Nakamura et al. (JP 57194548 A) and Cabral, Jr. et al. (2002/0022366 A1).

4. Regarding claim 82, Paek et al. discloses the following elements:

- A method of forming a low electrical resistance metal silicide, comprising:
  - Forming a first metal silicide layer over a substrate, the first metal silicide layer having a melting point higher than 1700°, the first metal silicide layer having a thickness of at least about 50A and comprising a predominate metal (col 4, lines 1-5; Fig. 3B);

- Forming a second metal silicide layer over a substrate (col 4, lines 5-9; Fig. 3B);
- Patterning the first metal silicide layer and second metal silicide layer into a line having substantially vertical sidewalls (Fig. 3B).

5. Yet, Paek et al. does not disclose the following:

- a) Forming the second silicide layer by forming a metal-containing layer directly against the first metal silicide layer and converting the metal of the metal-containing layer to metal silicide.
- b) Forming a silicon-containing layer directly against the metal containing layer and on an opposing side from the first metal silicide layer.
- c) The first metal silicide layer is metal-enriched.

6. Regarding (a) and (b), Paek et al. discloses forming a second metal silicide layer over a first metal silicide layer and substrate but does not disclose that such a silicide layer is formed by forming a metal-containing layer directly against a first metal silicide layer, forming a silicon-containing layer directly against the metal-containing layer, and then converting the metal of the metal-containing layer to a metal silicide. However, Nakamura et al. discloses a method of forming a refractory metal silicide layer by depositing a metal film followed by a silicon film and then annealing. Nakamura et al. discloses that such a method prevents oxidation of the refractory metal layer prior to silicide formation (Abstract). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Paek et al. with forming the second silicide layer by forming a metal-containing layer

and silicon-containing layer against it, so as to form the silicide layer without causing undesirable oxidation.

7. Regarding (c), Paek et al. discloses forming a first silicide layer but does not disclose that it is metal-rich. However, Cabral, Jr. et al. discloses forming a first silicide layer that is metal-rich so as to minimize silicon consumption during silicide formation ([0080]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Paek et al. with forming a metal-rich first silicide, as taught by Cabral, Jr. et al., so as to minimize silicon consumption during silicide formation.

8. Regarding claim 83, Paek et al. discloses that the first metal silicide layer is formed on a non-silicon-containing electrically conductive material (col 3, lines 28-44).

9. Regarding claim 84, Nakamura et al. discloses that the silicon-containing layer consists essentially of silicon or conductively-doped silicon (Abstract).

10. Regarding claim 86, Paek et al. discloses that the substrate comprises silicon, and wherein the first metal silicide layer is formed directly against polysilicon, which is incorporated into the silicon of the substrate (col 3, lines 48-56; col 4, lines 1-4).

11. Regarding claim 87, Paek et al. discloses that the first metal silicide consists essentially of tantalum silicide and the second metal silicide layer consists essentially of titanium silicide (Fig. 3B; col 4, lines 56-58).

12. Claim 85 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paek et al. (U.S. 6,774,023 B1), Nakamura et al. (JP 57194548 A), and Cabral, Jr. et al.

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(2002/0022366 A1) as applied to claim 82 above, and further in view of Pan et al. (U.S. 6,613,673 B2).

13. Regarding claim 85, Paek et al., Nakamura et al., and Cabral, Jr. et al. do not disclose forming a layer of silicon nitride over a silicon-containing layer. However, Pan et al. discloses forming and patterning a silicon cap on a metal silicide layer (col 3, lines 53-60) so as to prevent moisture contamination of the underlying layers. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Paek et al., Nakamura et al., and Cabral, Jr. et al. with using a silicon cap overlying the metal silicide layer, as taught by Pan et al., so as to prevent moisture contamination of the underlying layers.

### ***Response to Arguments***

14. Applicant's arguments with respect to claims 82-87 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reema Patel whose telephone number is 571-270-1436. The examiner can normally be reached on M-F, 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RSP  
5/23/07

SCOTT B. GEYER  
PRIMARY EXAMINER

*Mr. G* 5/24/07